

Effect of vitamin B12 and folate of Chlorella in healthy adult men**Poster presentation at the 3rd International Conference on Pharma-Food****[Objectives]**

It has been known that the well-known dietary supplement Chlorella includes vitamin B12, which is rare as a vegetable food. However, according to the description on Chlorella in the Information system on safety and effectiveness for health foods of the National Institute of Health and Nutrition, it has been mentioned that vitamin B12 in Chlorella may be a biochemically inactive form (It cannot be used in a body if it is ingested).

Thus we have investigated whether the form of vitamin B12 in Chlorella can be used in a body or not and also effect of vitamin B12 and the absorption pathway of folate, which simultaneously acts with vitamin B12, when Chlorella is drunk.

[Methods]

- 1 To determine whether the form of vitamin 12 in Chlorella can be used in a body or not, we measured the form of vitamin B12 in Chlorella using LC/ESI-MS/MS method^{*1}.
- 2 To investigate the form of vitamin B12 in Chlorella can be used in a body or not, we asked 3 healthy adult men to drink 8 g of Chlorella a day for 1 year and measured blood levels of homocysteine, folate, and vitamin B12 every 3 months. Subjects were asked to have a test with MTHFR gene, which is involved with metabolism efficiency of homocysteine beforehand. (It has been known that blood levels of folate and vitamin B12 are low, while homocystein level is high in people with a genotype of MTHFR, of which metabolism efficiency of homocysteine is poor.)
- 3 Although usually folate is absorbed from the small intestine, since folate is produced by enteric bacterium in the large intestine and Chlorella increases lactobacilli, we have explored the folate absorption pathway in the large intestine. Six-week-old male mice (Slc:C57BL/6 (SPF)) were reared under the condition of either normal food (N=6) or 5% Chlorella mixed food (N=6) for 4 weeks, and the blood folate level and the expression level of folate transporter genes in the large intestine were analyzed.

[Results]

- 1 Vitamin B12 in Chlorella had a structure similar to vitamin B12 that could be used in a body. (Figure 1)
- 2 Blood levels of folate and vitamin B12 have increased in all subjects by drinking Chlorella. It was also found that blood homocysteine level greatly decreased in subjects, of which metabolism efficiency of homocysteine was poor. (Figure 2)
- 3 Blood levels of folate exhibited an upward trend by ingestion of Chlorella, while expression

level of folate transporter genes in the large intestine also exhibited an upward trend. (Figure 3)

Based on the above results, vitamin B12 in Chlorella was found to be used in a body, and folate was suggested to be absorbed from the large intestine as well.

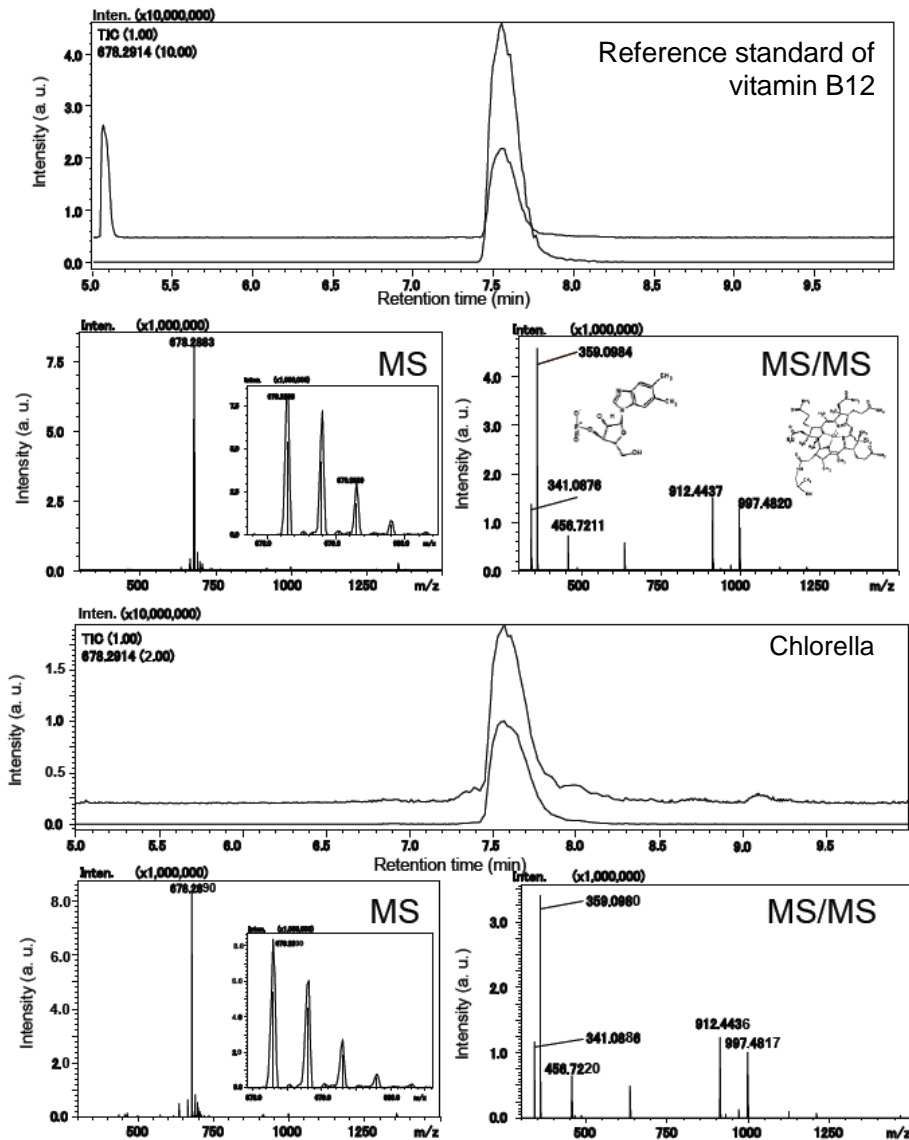


Figure 1. The structure of vitamin B12 in Chlorella

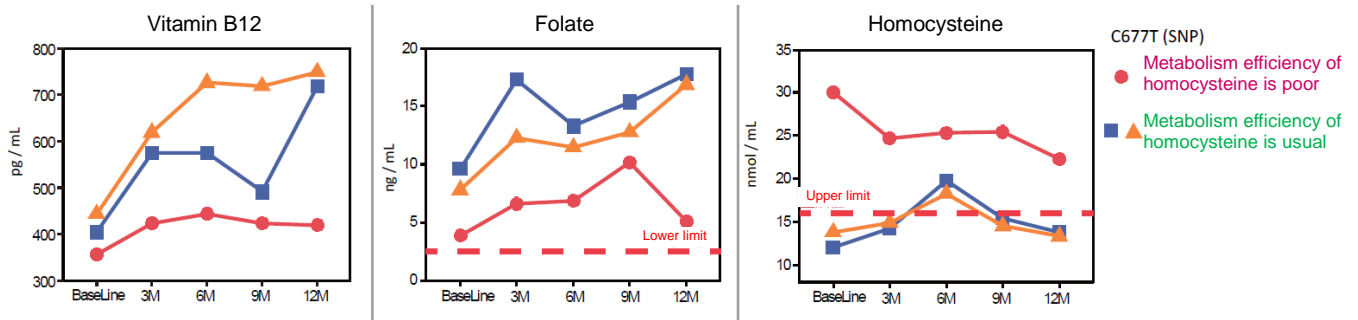


Figure 2. Changes in blood levels by drinking Chlorella

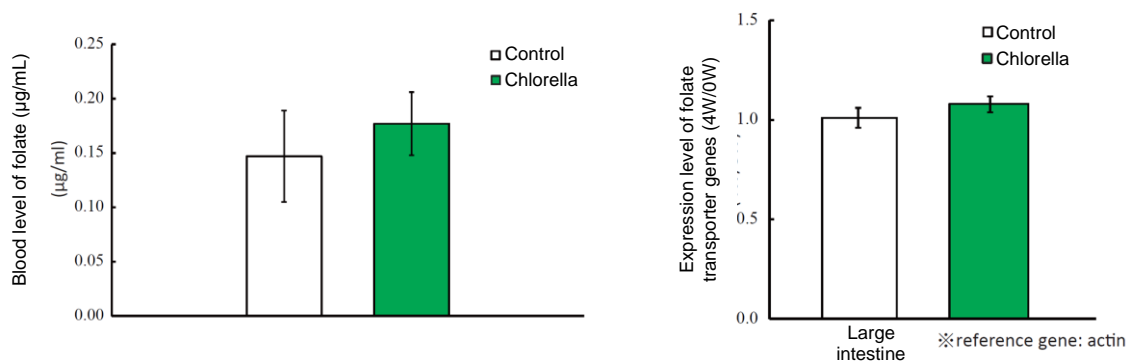


Figure 3. Changes in the blood levels (left) and the gene expression level of folate transporters (right) by intake of Chlorella

[Explanation of terms]

*1 The method with which a molecular weight and information of the structure can be obtained. It is used for analysis of natural products and pharmaceuticals.

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Title: Effect of Chlorella supplementation on vitamin B₁₂ and folate status of healthy human adults

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